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Fatty Liver Hemorrhagic Syndrome in Laying Hens

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Fatty liver hemorrhagic syndrome (FLHS), a major cause of mortality among caged laying hens, was second (15%) to lymphoid leukosis in 1975 among those hens submitted to the Animal Disease Research and Diagnostic Laboratory from this research station. The disease is characterized by a 20 to 25% increase in body weight, a 25 to 30% decrease in egg production and an increase in mortality from excessive liver fat and liver hematomas. Two more experiments on this subject have been completed. One used a normal feeding regime and the other used the force-feeding technique described in last year's Poultry Day Report (A.S. Series 75-28).

In the first experiment ad libitum feeding of a high energy (10% fat), corn soybean diet was tested for twelve 28-day periods using 308 hens. Biotin and choline alone and combined at twice the NRC recommended levels were supplemented to give four diets. Three commercial strains of pullets that had been grown on 10% protein low density or 12% protein high density diets were used for the experiment. Three replicates of 4 hens each completed the factorial design.

In the second experiment, corn and wheat-soybean diets (14% protein, 2% fat) were tested at three levels of consumption using the force-feeding technique. Attempts were made to feed at 120 and 140% of normal feed consumption for both types of diets. Five replicates (1 hen/rep) for a total of 30 hens were force-fed for 3 weeks.

Several of the production parameters and the liver data are shown in tables 1 and 2 for experiment 1. Hen-day production was considered quite low, averaging about 61%. Choline enhanced egg production over that of the controls, while the strain of birds had little effect. Pullets grown on a 10% protein diet produced more than those grown on 12% protein. Feed consumption was low due primarily to the high energy level of the diet. The largest intake differences occurred between strains although these were not significant. No significant differences were obtained in body weights.

Some definite trends are apparent for total liver lipid. Although previous grower diets had little effect, there were differences between strains, with strain 1 having the highest tendency to accumulate liver fat. Choline and biotin decreased liver lipid, with choline having the most consistent and dramatic effect, reducing liver lipid by 50%.

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[1]Superintendent, Poultry Research Center, and Professor and Leader, Poultry Research and Extension, respectively.

Table 3 includes the production data for experiment 2. The decreased egg production and increased body weight data for the force-fed groups are symptoms often seen with FLHS. Those birds being force-fed were allowed to eat additional feed which accounts for some of the variation from the attempted 120 and 140% intake.

The data in table 3 also show some definite increases in liver values with increases in feed consumption. Dramatic increases in liver weight, liver score and total liver lipid were obtained through force-feeding, with the corn diet having the more severe effects. The hens on both diets showed symptoms that were typical of FLHS.

Table 1. Effects of Diet and Strain on Production Parameters with Ad Libitum Feeding (Experiment 1)

	Hen-day production	Hen-day feed consumed	Initial body weight	Final body weight
	%	gm	kg	kg
Control	59[b] [1]	94	1.56	1.86
Control + choline	65[a]	94	1.56	1.90
Control + biotin	56[b]	88	1.48	1.82
Control + choline + biotin	66[a]	92	1.51	1.79
10% protein grower diet	64[a]	92	1.49	1.80
12% protein grower diet	59[b]	92	1.57	1.88
Strain 1	61	96	1.52	1.88
Strain 2	62	92	1.61	1.83
Strain 3	61	88	1.45	1.80

[1]Data with different superscripts differ at the $P<0.05$ level of significance.

Table 2. Effects of Ad Libitum Feeding on Total Liver Lipid (gm) (Experiment 1)

	Grower diet	Layer diet				
		Control	Control + choline	Control + biotin	Control + choline + biotin	Avg.
Strain 1	10%	10.1	12.9	14.0	7.1	11.0
	12%	21.2	7.4	6.2	4.8	9.9
Strain 2	10%	11.1	4.4	9.0	3.7	7.1
	12%	17.5	5.2	10.6	5.3	9.7
Strain 3	10%	10.7	5.9	9.4	6.6	8.2
	12%	9.2	5.6	10.5	3.7	7.3
Average		13.3	6.9	10.0	5.2	

Table 3. Effects of Force Feeding at Two Levels on Egg Production and Liver Parameters (Experiment 2)

	Hen-day production	Hen-day feed consumed	Average weight gain	Average liver weight	Average liver score[1]	Total liver fat
	%	gm	gm	gm		gm
Corn, normal	78.4	84	63	34.5	1.2	3.82
Corn, 120%	74.6	101 (120%)	332	62.3	2.8	18.06
Corn, 140%	74.6	118 (140%)	337	76.2	2.6	22.80
Wheat, normal	86.8	87	83	35.0	1.0	5.59
Wheat, 120%	72.2	103 (118%)	174	41.9	1.4	6.55
Wheat, 140%	72.4	119 (137%)	218	55.5	3.0	12.20

[1] 1 = no hemorrhages; 2 = 1-10 hemorrhages; 3 = 10-25 hemorrhages; 4 = greater than 25 hemorrhages.